Review of the *Lutjanus campechanus* Complex of Red Snappers

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The taxonomic status of certain species of *Lutjanus*, commonly known as red snapper, has remained confused in spite of several reviews during the past 80 years (Jordon and Swain, 1885; Jordan and Fesler, 1893; Jordan and Evermann, 1898; Hildebrand and Ginsburg, 1925; Ginsburg, 1930).

As pointed out by Camber (1955) and Carpenter (1965) at least 10 species of snappers are marketed as red snapper. Commercial fishermen, however, recognize each of these as a separate species to which they refer by its individual common name. The designation of "red snapper" is given only to the species variously referred to in the literature as *Lutjanus aya*, *L. blackfordi*, and *L. campechanus*, and sometimes also to *L. vivanus* better known as "silk snapper."

This study shows that, in addition to the silk snapper, there are two species of what may be called true red snappers. One of these, *L. campechanus*, appears to be restricted to the Gulf of Mexico and the South Atlantic coast of the United States. It perhaps also occurs in Bermuda, the Bahamas, and along the north coast of Cuba. The other, *L. purpureus*, occurs in the Caribbean Sea and its range extends southeastward along the coast of the Guianas and probably to Brazil. Commercial fishermen call *L. campechanus* the "Gulf red snapper" and *L. purpureus* the "Caribbean red snapper."

Although Hildebrand and Ginsburg (1925) and Ginsburg (1930) had previously recognized two species of red snappers their conclusions were open to question. Because of the paucity of specimens available to them it was thought that the apparent specific differences might be due to intraspecific variation. In addition these authors misinterpreted the nomenclature as discussed below under the species headings.

This study also shows that *L. vivanus*, the silk snapper, is closely related to *L. campechanus* and *L. purpureus*, especially to the latter with which it has been confused. These three species, herein referred to as the *L. campechanus* complex, form a group well distinguished from the other members of the genus *Lutjanus*. Ginsburg (1930) pointed out the close relationship among these three species.

Material and Acknowledgments

Positive identification of the Gulf and the Caribbean red snappers was initially effected by the study of fresh caught specimens generously supplied by Clark Seafood, Inc., Pascagoula, Mississippi, through the cooperation of Harvey R. Bullis, Jr. Later pertinent material was studied at the United States National Museum (USNM) and the University of Miami Ichthyological Museum (UMIM). The Museum of Comparative Zoology (MCZ) and the Academy of Natural Sciences of Philadelphia (ANSP) made critical specimens available for study. The cooperation of Ernest A. Lachner (USNM), Mrs. Mywanwy M. Dick (MCZ), and James Tyler (ANSP) is sincerely appreciated.

A total of 188 specimens were examined. The number (in parentheses) following the catalogue number indicates the number of specimens in the lot.

Methods

Measurements and counts were made according to methods already described by the author (Rivas, 1960) with the following modifications and additions.

The mandible length is measured from the anterior tip of the dentary to the posterior tip of the articular.

Lateral scales were counted as the number of oblique rows (inclined forward) above the lateral line between the posttemporal (scale bone) and the middle of the caudal base. The scales above lateral line were counted downward and backward from the dorsal fin origin to, but not including, the lateral line. The scales below lateral line were counted upward and forward from the anal fin origin to, but not including, the lateral line. Opercular scales were counted as the number of rows parallel with the margin of the subopercle; the uppermost row may comprise only one scale. The scales above opercle were counted as the number of oblique rows (inclined forward) above the opercle.

In the tables (2-4) discrepancies between the number of specimens included and the total number of specimens available for scale counts are due to partial or nearly total loss of scales as a result of poor preservation. This occurred most frequently in the *L. campechanus* specimens.

The gillraker counts presented a problem. In juveniles and young the anterior rakers of the lower limb (first arch), although

short, may be made out easily. In the adults, however, these rakers are reduced to tubercles which are difficult to distinguish from the inter-raker tubercles. Also, the young show no distinction between developed and undeveloped (rudiments) gillrakers, in contrast with the adult. On the upper arch all gillrakers whether developed or rudimentary can be made out in both young and adult. For this reason rudiments are not included in the counts for the lower limb and, for this character, only specimens 100 mm in standard length or larger are included in the key and Table 5.

Because of the long-standing confusion it has been difficult to untangle the synonymies and references. Many references could not be verified through lack of adequate descriptions, figures, or records of available specimens. These references are not listed.

Nonapplicability of Names Proposed by Bloch

Since its original proposal the specific name *aya* has been frequently applied to the red snapper. However, a study of the original description of *Bodianus aya* Bloch (1790, p. 45) reveals that the name almost certainly does not apply to a species of *Lutjanus*.

Bloch states that a spine occurs at the posterior tip of the opercle but this is not so in *Lutjanus*. The number of branchiostegals in lutjanids is 7, not 5 as stated by Bloch. His figure clearly shows 9 dorsal spines followed by 19 rays and one anal spine followed by 8 rays. In the text the number of dorsal spines is given as 9 and the total number of dorsal elements as 27. The total number of anal elements is given as 9 of which one is a spine. In western Atlantic *Lutjanus* there are 10 dorsal spines, not 9, and 12-14 dorsal rays, not 18 or 19, with a total of 22-24, not 27 or 28 dorsal elements. There are 3 anal spines and 8 or 9 anal rays, a total of 11 or 12, not 9 anal elements. The anal fin is described (and figured) as rounded whereas in the red snappers it is conspicuously pointed. Also the anal fin is placed too far back and the pectoral and pelvic fins are too short. Although not described in the text the figure clearly shows the occurrence of scales on the interorbital, top of snout, preorbital, and suborbital. These areas are devoid of scales in *Lutjanus*. Finally, the habitat of *aya*, as given by Bloch (lakes of Brazil) is certainly not that of the red snappers.

Bloch's figure is reminiscent of a *Sciaenops*-like sciaenid except

for the shape of the dorsal and caudal fins. Although a red color is not common among sciaenids it does occur in *Sciaenops ocellata*, the channel bass, also commonly known in Florida as "redfish." The profile and squamation of the head, as shown in Bloch's figure, are sciaenid-like. The emarginate caudal fin, as described and figured, is not a sciaenid feature, but in the adult *Sciaenops* the caudal fin is truncate or even somewhate emarginate. The single anal spine is another sciaenid feature which occurs in several species of *Cynoscion* and in Menticirrhus. With respect to the habitat given by Bloch, "Landseen von Brasilien," it may be said that it would apply to a sciaenid rather than to a red snapper. It is possible that the name *aya* will eventually be found to apply to an as yet unrecognized sciaenid from the little known coastal lagoons of Brazil.

At best, some sort of perciform fish is recognizable from Bloch's description and figure but certainly not a lutjanid. There is no specimen available whereupon the identity of *aya* could be verified since the name was based on a pre-Linnaean description by Marcgrave and a drawing presumably by Prince Maurice. Although Cuvier and Valenciennes (1828, p. 346) claim that the original figure was altered in Bloch's copy, Prince Maurice's drawing is equally unidentifiable.

The name *Bodianus ruber* Bloch and Schneider (1801, p. 330) was based on a condensed version of the original description of *Bodianus aya* Bloch.

The *Lutjanus campechanus* Complex

The western Atlantic species of *Lutjanus* may be subdivided into three well defined species groups as characterized in the following key.

1a. Scales above opercle in 2 or 3 rows. Lateral scales 40 to 48, usually 41 to 47. Jaws subequal or upper jaw projecting beyond lower. Accessory lateral lines on caudal fin absent, or rarely present only on lower half. Lateral spot absent. Coloration not predominantly red in life. 1. *L. griseus* species group

1b. Scales above opercle in 4 to 7 rows. Lateral scales 46 to 53, usually 47 to 51. Lower jaw slightly to strongly projecting beyond upper. Accessory lateral lines on caudal fin present. Lateral spot present or absent. Coloration predominantly red in life.

2a. Dorsal rays 12, rarely 13. Two vertical rows of scales between

posterior margin of orbit and upper end of preopercular margin. Lower jaw strongly projecting beyond upper. Lateral spot present.
2. *L. synagris* species group

2b. Dorsal rays 14, rarely 13. Three or four vertical rows of scales between posterior margin of orbit and upper end of preopercular margin. Lower jaw slightly projecting beyond upper. Lateral spot present or absent.
3. *L. analis* species group

The *L. campechanus* complex (*L. campechanus, L. purpureus, L. vivanus*) belongs to the *L. analis* species group, which also includes *L. buccanella.* The relationships among these species are analyzed in the following key, which also provides a means for identification.

1a. Pectoral rays 15 to 17, usually 16. Gillrakers 7 or 8; only one developed on upper limb. Lingual teeth absent. Vomerine patch of teeth crescent-shaped, without a median backward extension. Suborbital width 10 to 12 percent of standard length. Lateral spot present in young and adult.
1. *L. analis*

1b. Pectoral rays 16 to 18, usually 17. Gillrakers 8 to 12, usually 9 to 11; one to three, usually two developed on upper limb. Lingual teeth present. Vomerine patch of teeth anchor-shaped, with a median backward extension. Suborbital width 6 to 9 percent of standard length. Lateral spot always absent or present only in young.

2a. Scales above opercle in 4 to 6, usually 5 rows. Lingual teeth in a single patch. Posterior margin of anal fin rounded, the middle rays not exserted, Anal fin length 59 to 64 percent of head length. A conspicuous jet-black, comma-shaped mark on base of pectoral fin. Tips of middle caudal rays not black. Lateral spot always absent.
2. *L. buccanella*

2b. Scales above opercle in 6 or 7 rows. Lingual teeth in two patches, the anterior one much smaller. Posterior margin of anal fin angulate or pointed, the middle rays exserted. Anal fin length 65 to 81 percent of head length. No jet-black, comma-shaped mark on base of pectoral fin. Tips of middle caudal rays black, the fin sometimes entirely margined with black. Lateral spot present in young, diffuse or absent in adult. (*L. campechanus* complex).

3a. Anal rays 9, rarely 8. Lateral scales 46 to 50, usually 47 to 49. Scales above lateral line 7 to 10, usually 8 or 9. Scales below lateral line 15 to 19, usually 16 or 17. Gillrakers 8 to 11, usually 10. Scales on anterior side of body, below lateral line, conspicuously larger than those on posterior side. Suborbital width 8 or 9 percent of standard length.
3. *L. campechanus*

3b. Anal rays 8, rarely 9. Lateral scales 49 to 53, usually 50 or 51. Scales above lateral line 9 to 12, usually 10 to 12. Scales below lateral line 16 to 24, usually 17 to 23. Gillrakers 9 to 12, usually 10 or 11. Scales on anterior side of body, below lateral line, not conspicuously larger than those on posterior side. Suborbital width 6 or 7 percent of standard length.

4a. Scales below lateral line 16 to 19, usually 18. Scales above lateral line 9 to 11, usually 10. Cheek scales in 6, rarely 5 or 7 rows. Scales above lateral line, on anterior side of body, smaller than those below. Pelvic fin length 53 to 62 percent of body depth. Lateral spot, when present (young), about equal to, or larger than eye. Iris red in live and freshly preserved specimens.

4. *L. purpureus*

4b. Scales below lateral line 20 to 24, usually 21 to 23. Scales above lateral line 10 to 12, usually 11 or 12. Cheek scales in 7, rarely 8 rows. Scales above lateral line, on anterior side of body, about equal to those below. Pelvic fin length 63 to 76 percent of body depth. Lateral spot, when present (young), smaller than eye. Iris yellow in live and freshly preserved specimens.

5. *L. vivanus*

For more rapid and positive identification, with the *campechanus* complex, the sum of lateral scales and scales above and below lateral line may be used. This is 69-75 in *campechanus*; 77-81, rarely 76 or 82 in *purpureus*; and 82-87, rarely 81 or 88 in *vivanus*.

Lutjanus campechanus (Poey)

Gulf red snapper

Mesoprion campechanus Poey, 1860, p. 149 (original description; no specific locality designated); 1861, p. 365 (listed; common name; Campeche, from hearsay); 1868, p. 294 (eye color; weight; Campeche; Key West; Cuba, from hearsay).

Lutjanus campechianus, Poey, 1875, p. 29 (references; vomerine teeth; comparisons; Key West; Campeche); 1962, p. 86 (description; comparisons; history; Key West; Campeche; Habana), pls. 70 C-J, 71 A-C.

Lutjanus blackfordii Goode and Bean, 1879, p. 176 (original description; comparison; Pensacola; Savannah).

Lutjanus blackfordii, Hildebrand and Ginsburg, 1925, p. 80 (description; comparison; Pensacola; Rebecca Shoals; Key West), fig. 1. Ginsburg, 1930, p. 269 (characters; commercial importance; biology; nomenclature; synonymy).

Lutjanus vivanus (not of Cuvier and Valenciennes), Jordan and Swain, 1885, p. 453 (comments; synonymy in part; Key West).

Lutjanus aya (not of Bloch), Jordan and Fesler, 1893, p. 447 (common names; synonymy in part; habitat in part; occurrence in part; specific name doubted; comments on types of *campechanus* and *blackfordi*), pl. 30. Carpenter, 1965, pp. 1-35 (review of fishery; Gulf of Mexico), fig. (cover photograph).

Neomaenis aya (not of Bloch), Jordan and Evermann, 1898, p. 1264 (common names in part; description; comments on type of *campechanus;* synonymy in part; Key West), pl. 197, fig. 516.

As the names *aya* Bloch (1790) and *ruber* Bloch and Schneider (1801) do not apply to a snapper, *campechanus* Poey (1860) is the oldest name available for the Gulf red snapper.

The most recent reviewers (Hildebrand and Ginsburg, 1925, p. 82; Ginsburg, 1930, p. 372) applied the name *campechanus* to the Caribbean red snapper. The evidence presented below, however, indicates that the name *campechanus* refers to the Gulf red snapper and that the frequently accepted name *blackfordi* is synonymous with it.

In the first paragraph of the original description Poey states that the fish is so named (*campechanus*) "parce qu'on le pêche également sur le banc de Campêche . . . " Although no specific locality is given in the original description Poey subsequently states (1868, 1875) that his *campechanus* is taken in Campeche Bank and in Key West. In his last (posthumous) publication Poey (1962) added Havana to Campeche Bank and Key West. Poey never gave any indication that *campechanus* occurred outside the Gulf of Mexico. As already indicated in the introduction the Caribbean red snapper (*purpureus*) is not known to occur in the Gulf of Mexico and the Gulf red snapper is not known to occur in the Caribbean.

Since critical diagnostic characters were not given by Poey, the original description of *campechanus* could apply to either the Gulf or the Caribbean red snapper. In the light of the above discussion, however, and since the type almost certainly came from Key West (see below), the name *campechanus* is here accepted as the valid one for the Gulf red snapper.

Jordan and Evermann (1898) stated that the type of *campechanus* " . . . is a stuffed skin of a young fish . . . " without any indication of length or locality. Subsequently Howell-Rivero (1938,

p. 196) stated that the types of *campechanus* comprise two specimens (MCZ 9982) the largest of which is the "holotype." A study of these specimens, however, shows that they actually are Caribbean red snapper (*purpureus*) and neither one could have been Poey's type of *campechanus* for the following reasons.

The original description of *campechanus* was based on a single specimen 370 mm. in length (total, as it was customary with Poey). The largest specimen, considered by Howell-Rivero as the "holotype," is 355 mm in total length, 15 mm short of the required length. The caudal fin is undamaged.

Among the specimens examined at the United States National Museum a Gulf red snapper (USNM 25235) 373 mm in total length (285 mm standard length) is believed to be the holotype of *campechanus*. The length is almost in perfect agreement and, according to the records, the specimen came from Key West (to Havana) and was sent by Poey. Furthermore, this specimen has only 8 anal rays (as given in the original description) instead of 9 which is the usual number for *campechanus* (Table 5). This specimen, here recognized as the holotype, is described as follows.

Dorsal spines, 10. Dorsal rays, 14. Anal spines, 3. Anal rays, 8. Pectoral rays, 17. Lateral scales, 47. Scales above lateral line, 7; below, 17. Cheek scales in 6 rows. Gillrakers, 9 (plus 5 rudiments); one (plus 5 rudiments), on upper limb. Predorsal length, 418. Preanal length, 710. Head length, 400. Snout length, 153. Suborbital width, 88. Maxillary length, 151. Mandible length, 193. Orbit diameter, 67. Interorbital width, 84. Body depth, 386. Caudal peduncle depth, 121. Dorsal base length, 505. Anal base length, 154. Pectoral fin length, 323. Pelvic fin length, 235. Anal fin length, 272. Middle caudal rays length, 203. Scales on anterior side of body, below lateral line, conspicuously larger than those on posterior side. Scales above lateral line, on anterior side of body, smaller than those below. Posterior margin of anal fin pointed, the middle rays exserted. Lingual teeth in two patches, the anterior one much smaller. Vomerine patch of teeth anchor-shaped, with a median backward extension. General coloration yellowish-brown after more than 100 years in preservation. Tips of middle caudal rays black.

The holotype of *L. blackfordi* from Pensacola, Florida, 544 mm in standard length (USNM 21330) has been examined and found to be conspecific with *campechanus*. Two specimens of *campech-*

anus, 585 and 606 mm in standard length (USNM 87823, 87824), reported by Hildebrand and Ginsburg (1925, p. 81) as *blackfordii* have also been examined.

Camber (1955, p. 16) discussed the occurrence of two "types" of red snapper in the Gulf of Mexico (Campeche Bank). Type B consisted of 16 specimens which were less humped, more slender, and with smaller scales than 619 specimens of Type A. Camber also stated that radiographs showed osteological differences between the two types but he did not say what those differences were. The more slender smaller-scaled specimens of Type B are suggestive of the Caribbean red snapper (*purpureus*) but the material examined in this study does not show any species differences correlated with Camber's types A and B. Of the specimens examined from Campeche Bank, including some used by Camber in his study (UMIM 4848), some were slender, some were humped, and some were intermediate. In fact, there was gradual intergradation between the extremes corresponding to Camber's types. There was no correlation between body depth and relative size (number) of scales or any other meristic, proportional, or color character. All these specimens are typical *campechanus.* The possibility, however, that *purpureus* may occur in the Gulf of Mexico cannot be dismissed.

This species differs from *purpureus* and *vivanus* in the higher number of anal rays (Table 5), the fewer scales and gillrakers (Tables 2-5), the longer head, snout, maxillary, mandible, and anal fin, the deeper body, and the wider suborbital (Table 1). The enlarged scales on the anterior side of the body are a good field character to distinguish *campechanus* from *purpureus* and *vivanus.*

The distribution of *campechanus* appears to be restricted to the shelves bordering the Gulf of Mexico and the South Atlantic coast of the United States northward to Cape Hatteras. No verifiable records from the Bahamas, the North coast of Cuba, or the Caribbean Sea are available to the author. In South Florida and Campeche Bank, at least, *campechanus* occurs syntopically (Rivas, 1964) with *vivanus.*

The absence of a shelf along the Caribbean coast of Yucatan and the Caribbean coast of extreme western Cuba, and on both sides of the Windward Passage may be of significance in the allopatric distribution of *campechanus* and *purpureus.* The collecting records available and other sources (Camber, 1955, p. 23) indicate

that these two species usually occur at depths of less than 80 fathoms.

Good illustrations of *campechanus* are given by Hildebrand and Ginsburg (1925, fig. 1, as *Lutianus blackfordii*) and by Carpenter (1965, cover photograph, as *L. aya*).

The commercial fishery for this species has been recently reviewed in detail by Carpenter.

Material examined. 129 specimens from the following 36 localities. *Campeche Bank:* Triangle lighthouse, USNM 196785 (1); 28 n. mi. ESE of Arcas Cays, USNM 158426 (3); 12 n. mi. NE of Arcas Cays, UMIM 4839 (1); Arenas Cays, UMIM 6107 (12); 65 n. mi. WNW of Campeche, Mexico, UMIM 4837 (1); 130 n. mi. NW of Campeche, Mexico, UMIM 4840 (2); 58 n. mi. NW of Campeche, Mexico, UMIM 4836 (1); 75 n. mi. N of Carmen, Mexico, UMIM 2425 (2); Gulf of Campeche, UMIM 1226 (1); UMIM 4842 (2); UMIM 4848 (15). *Off Texas:* 80 n. mi. S of Galveston, USNM 126763 (1); 83 n. mi. S of Galveston, USNM 185539 (1); 19 n. mi. E of Brazos Santiago, UMIM 2419 (11); 115 n. mi. ESE of St. Josephs Island, UMIM 2420 (15); 98 n. mi. E of Corpus Christi, UMIM 4883 (14). *Off Louisiana:* 25 n. mi. SE of Barataria Bay, UMIM 4841 (14). *Off Mississippi:* S of Mississippi Delta, USNM 155381 (1); USNM 155382 (1); S of Horn Island, UMIM 6061 (1). *Off Alabama:* 35 n. mi. SW of Mobile, UMIM 2422 (6). *Off Florida:* S of Pensacola, USNM 21330 (1); USNM 158625 (1); USNM 30682 (1); USNM 31918 (1); USNM 21463 (1); 22 n. mi. NNW of Loggerhead Key, Dry Tortugas, UMIM 4843 (1); off Rebecca Shoals, USNM 87824 (1); 5 n. mi. N of Rebecca Shoals, UMIM 2374 (4); off Key West, USNM 25235 (1); off Miami, UMIM 672 (4); off Port Everglades, UMIM 4368 (1); 44 n. mi. SE of Cape Canaveral, UMIM 6071 (3); 33 n. mi. ENE of St. Augustine, USNM 188515 (1). *Off North Carolina:* E of Cape Hatteras, USNM 133966 (1).

Lutjanus purpureus Poey

Caribbean red snapper

Mesoprion aya (not of Bloch), Cuvier and Valenciennes, 1828, p. 346 (description; size; comments; Haiti). Poey, 1866, p. 267 (compared with *profundus* = *vivanus;* name *purpureus* attributed to Cuvier and Valenciennes; Santo Domingo).

Lutjanus purpureus Poey, 1867, p. 157 (compared with *profundus* = *vivanus*); 1875, p. 28 (name attributed to Cuvier and Valenciennes; compared with *profundus* = *vivanus*), p. 29 (original designation of name *pur-*

pureus; synonymy in part; eye color; Batabano, Cuba). Jordan and Fesler, 1893, p. 446 (comments on validity and name).

?Neomaenis aya (not of Bloch), Evermann and Marsh, 1900, p. 174 (common names; description; life color; range in part; commercial value; habits; angling value; synonymy excepted; Puerto Rico), pl. 20.

Lutianus campechanus (not of Poey), Hildebrand and Ginsburg, 1925, p. 82 (description; comparison; off Honduras). Ginsberg, 1906, p. 268 (characters in key), p. 273 (comments; comparison; eye color; nomenclature; synonymy in part; off Honduras). Howell-Rivero, 1938, p. 196 (specimens only: erroneously designated as types of *L. campechanus*).

Lutjanus aya (not of Bloch), Poey, 1962, p. 85 (synonymy in part; coloration; compared with *profundus* = *vivanus;* comments; history; Batabano, Buba; Santo Domingo; Puerto Rico), pl. 70 B.

The use of the name *purpureus* for the Caribbean red snapper appears to be justified on the basis of the following discussion.

Poey (1866, p. 267) stated that Cuvier and Valenciennes (1828, p. 346) had changed the name *aya* to *purpureus* in a subsequent page of the same publication. At the same time Poey compared his *profundus* (= *vivanus*) with the *aya* of Cuvier and Valenciennes and commented that it (*aya*) could be confused with *profundus*. Poey also stated that he had seen a specimen from "Santo-Domingo" which he believed to be the same as Cuvier and Valenciennes' *aya* (*purpureus*) but different from his *profundus*. The name *purpureus* was never mentioned by Cuvier and Valenciennes and there is no explanation as to why Poey erroneously attributed the name to them. The fact remains, however, that Poey mentioned *purpureus* in his paper and that he recognized it as representing a red snapper closely related to, but different from *profundus* = *vivanus*. It is also significant that Poey does not mention *campechanus*, the other close relative described by him six years previously and which he probably considered distinct enough not to be confused with *purpureus* and *vivanus*. Subsequently Poey (1867, p. 157) stated that the main difference between *purpureus* and *profundus* (= *vivanus*) is the location of the small scales on either side of the nape. This difference, although real, is of very minor importance in distinguishing these two species. Later Poey (1875, p. 28) again erroneously attributed the name *purpureus* to Cuvier and Valenciennes. He also discussed his specimen from Santo Domingo (previously referred to by him, 1866, p. 267) as an individual 300 to 350 mm long, very similar to *profundus* (= *vivanus*)

but different and believed by him to be the true *purpureus*. In this paper, on the next page, Poey (1875, p. 29) formally listed "*Lutjanus purpureus*" as a species heading (between *L. profundus* and *L. campechianus*) with the names *aya* Bloch, *ruber* Bloch and Schneider, *aya* Cuvier and Valenciennes, and *purpureus* Cuvier and Valenciennes as synonyms. In addition, Poey stated that *purpureus* is also found in Santo Domingo and that he had seen it only once from Cuba (Batabano, south coast). Finally, in his last (posthumous) publication, Poey (1962, p. 85) listed *purpureus* as a synonym of *aya* which he considered distinct from *campechanus* and *profundus* (= *vivanus*). The specimen figured in this publication is said by Poey to have come from Batabano.

It may be concluded from the above discussion that the name *purpureus* refers to the Caribbean red snapper and that it should be attributed to Poey, not to Cuvier and Valenciennes. Also, although the name was mentioned by Poey in 1866 and 1867 his designation in 1875: 29 may be accepted as the original. Although no formal description or definition of *purpureus* was given by Poey in 1866, 1867, and 1875 the name may not be declared a *nomen nudum* according to the now current Rules since it was proposed before 1931 and there are sufficient "indications." In fact, the species was actually described and figured by Poey (1962, p. 85, pl. 70 B), as "*Lutjanus aya*" in his last publication.

Only one specimen was definitely referred to by Poey (1875, p. 28) as the true *purpureus*. He stated that the fish, from Santo Domingo, was " . . . de 300 a 350 milimetros de largo . . . " (total) and that it had been sent by him to Agassiz. There is only one specimen at the Museum of Comparative Zoology which could possibly be this specimen. It is the specimen (MCZ 9982), largest of two by 110 mm, erroneously designated as the holotype of *campechanus* by Howell-Rivero (1938, p. 196). This specimen, 355 mm in total length (273 mm. standard length), a typical *purpureus,* is here recognized as the holotype of the species and described below.

Dorsal spines, 10. Dorsal rays, 14. Anal spins, 3. Anal rays, 8. Pectoral rays, 17. Lateral scales, 50. Scales above lateral line, 10; below, 19. Cheek scales in 6 rows. Gillrakers, 11 (plus 5 rudiments); 2 (plus 5 rudiments) on upper limb. Predorsal length, 393. Preanal length, 698. Head length, 359. Snout length, 125. Suborbital width, 68. Maxillary length, 135. Mandible length, 166.

Orbit diameter, 77. Interorbital width, 84. Body depth, 352. Caudal peduncle depth, 111. Dorsal base length, 498. Anal base length, 139. Pectoral fin length not measured (tip broken off). Pelvic fin length, 206. Anal fin length, 249. Middle caudal rays length, 179. Scales on anterior side of body, below lateral line, not conspicuously larger than those on posterior side. Scales above lateral line, on anterior side of body, smaller than those below. Posterior margin of anal fin pointed, the middle rays exserted. Lingual teeth in two patches, the anterior one much smaller. Vomerine patch of teeth anchor-shaped, with a median backward extension. General coloration yellowish-brown after about 100 years in preservation. Tips of middle caudal rays black.

A specimen of *purpureus,* 540 mm. in standard length (USNM 87822) reported by Hildebrand and Ginsburg (1925, p. 82) as *Lutianus campechanus* has been examined.

This species differs from *campechanus* in the characters already indicated under that species. It is more closely related to *vivanus,* from which it differs mainly in the fewer scales (Tables 2-4), the shorter pectoral and pelvic fins (Table 1), the larger lateral spot, and the red eye (yellow in *vivanus*). The eye color combined with the number of anal rays and the relative size of the scales (see key) constitute good field characters to distinguish *purpureus* from *campechanus* and *vivanus.*

The collecting data of the specimens studied and the few verifiable records from the literature indicate that *purpureus* occurs on the shelves bordering the Caribbean Sea and that its range extends southeastward along the coast of the Guianas probably to Brazil. It is sympatric with *vivanus* with which it is also known to occur syntopically (see Rivas, 1964). As already indicated under *campechanus* the absence of a shelf on both sides of the Yucatan Channel and the Winward Passage may be of significance in the allopatric distribution of *purpureus* and *campechanus.*

A good illustration of *purpureus* (as *Lutianus campechanus*) is given by Hildebrand and Ginsburg (1925, fig. 2).

Material examined. 41 specimens from the following 17 localities. *Off Honduras:* no specific locality, USNM 87822 (1); UMIM 6112 (6). *Off Panama:* 3 n. mi. N of Cabo Tiburon, UMIM 6094 (2). *Off Colombia:* 28 n. mi. WSW of Cabo La Vela, UMIM 6111 (1). *Off Venezuela:* 22 n. mi. NE of Cabo La Vela (Colombia), UMIM 6086 (2); 12 n. mi. NNW of Punta Manzanillo, UMIM 6093 (2). *Off Aruba:*

5 n. mi. sw of w end, UMIM 6110 (1). *Off British Guiana: 70* n. mi. N of Georgetown, UMIM 2424 (10). *Off Surinam:* 65 n. mi. NE of Paramaribo, USNM 185195 (1); 60 n. mi. NNW of Paramaribo, USNM 185328 (1). *Off French Guiana:* 90 n. mi. NW of Cayenne, USNM 185047 (1); 80 n. mi. NNW of Cayenne, USNM 185307 (2), UMIM 2423 (2); 45 n. mi. NNE of Cayenne,USNM 185379 (3). *Off Lesser Antilles:* St. Lucia, USNM 41281 (1); Martinique, USNM 178626 (1). *Off Haiti:* Port-au-Prince, USNM 132545 (1), USNM 133695 (1). *Off Hispaniola?:* MCZ 9982 (2).

Lutjanus vivanus (Cuvier and Valenciennes)

Silk snapper

Mesoprion vivanus Cuvier and Valenciennes, 1828, p. 343 (original description; depth of capture; size; common names; Martinique). Jordan, 1887, p. 534 (comments on types).

Mesoprion profundus Poey, 1860, p. 150 (original description; Cuba); 1861, p. 365 (listed; common name; Cienfuegos, Cuba); 1866, p. 267 (compared with *aya* = *purpureus*); 1867: 157 (compared with *purpureus;* nuchal scales); 1868, p. 294 (common name; eye color; opercle; food value; weight). Howell-Rivero, 1938, p. 196 (synonymy; type specimens).

Lutjanus torridus Cope, 1871, p. 469 (original description; St. Kitts), fig. 5. Hildebrand and Ginsburg, 1925, p. 77 (species not identifiable from original description).

Lutjanus profundus, Poey, 1875, p. 28 (comments; compared with *purpureus*); 1962, p. 85 (compared with *aya* = *purpureus;* Cuba), pl. 70 A.

Lutjanus vivanus, Jordan and Fesler, 1893, p. 445 (common names; synonymy in part; eye color; comments). Hildebrand and Ginsburg, 1925, p. 78 (comments on identity). Ginsburg, 1930, p. 265 (common names; description; variation; economic importance; relationship; characters in key; nomenclature; synonymy; range; Campeche Bank), fig. 1.

Neomaenis vivanus, Jordan and Evermann, 1898: 1262 (common names; description; synonymy in part; Cuba). Evermann and Marsh, 1900: 175 (common names; description; synonymy; Puerto Rico).

Although lacking in most diagnostic characters the original description of *vivanus* obviously refers to one of the three species of the complex reviewed in this study. The Gulf red snapper, *campechanus,* may be eliminated on the basis of locality since *vivanus* was described from Martinique. The original locality, however, is of no value in deciding whether the name *vivanus* applies to the

silk snapper or to the Caribbean red snapper since both of these species are sympatric. The conspicuous black margin of the caudal fin and the depth of capture (90-100 fathoms) given by Cuvier and Valenciennes for *vivanus* may be good clues. In the silk snapper the black margin of the caudal fin is much more conspicuous than in the Gulf and the Caribbean red snappers. Also the silk snapper is usually taken along the edge of the shelf at depths of 80-120 fathoms whereas the other two species are usually taken at depths of less than 80 fathoms (Camber, 1955, p. 23, and personal observations).

Because of the statements in reference to depth of capture and the black margin of the caudal fin given in the original description there is the strong possibility that the name *vivanus* refers to the silk snapper rather than to the Caribbean red snapper, *purpureus* (see also discussion under the latter species). Furthermore, the name *vivanus* has been currently applied to the silk snapper and for the sake of stability it is advisable to retain it for the silk snapper.

Contrary to statements by Jordan and Swain (1885, p. 453), Jordan (1887, p. 534), and others, no specimen that could be considered as the type of *vivanus* was mentioned by Cuvier and Valenciennes in the original description. Therefore, there is no specimen in existence whereupon the name *vivanus* could be positively verified or a type designated.

In view of the absence of original type material a specimen from Mayaguez, Puerto Rico (closest available to type locality), 270 mm in standard length (USNM 164632) is here designated as the neotype of *vivanus* and described as follows.

Dorsal spines, 10. Dorsal rays, 14. Anal spines, 3. Anal rays, 8. Pectoral rays, 17. Lateral scales, 51. Scales above lateral line, 12; below, 22. Cheek scales in 7 rows. Gillrakers, 11 (plus 5 rudiments); 2 (plus 5 rudiments), on upper limb. Predorsal length, 400. Preanal length, 726. Head length, 374. Snout length, 140. Suborbital width, 66. Maxillary length, 145. Orbit diameter, 79. Interorbital width, 82. Body depth, 342. Dorsal base length, 495. Anal base length, 148. Pectoral fin length, 330. Pelvic fin length, 241. Anal fin length not measured (tip broken off). Middle caudal rays length, 189. Scales on anterior side of body, below lateral line, not conspicuously larger than those on posterior side. Scales above lateral line, on anterior side of body, about equal to those

below. Lingual teeth in two patches, the anterior one much smaller. Vomerine patch of teeth anchor-shaped, with a median backward extension. General coloration yellowish-brown after about 67 years of preservation. Tips of middle caudal rays black.

The original description of *profundus* (Poey, 1860, p. 150) refers to this species, but the two specimens recorded as "cotypes" by Howell-Rivero (1938, p. 196) are not the types of *profundus*. Poey stated that his description was based on a single specimen 260 mm (total length) but the specimens recorded by Howell-Rivero (MCZ 9966, 9990) have total lengths of 340 and 415 mm, respectively. One of two specimens sent by Poey to the United States National Museum and identified by him as *profundus* is almost certainly the original type. This specimen (USNM 24796), here recognized as the holotype of *profundus*, measures about 255 mm in total length (upper caudal fin lobe frayed), 198 mm in standard length, and bears Poey's original cloth tag with his species No. 28.

The holotype of *Lutjanus torridus* Cope (1871, p. 469) from St. Kitts, Lesser Antilles, 229 mm in standard length (ANSP 13225) has been examined and found to be conspecific with *L. vivanus*.

This species differs from *campechanus* in the characters already indicated under that species. As already discussed *vivanus* is more closely relate dt o*purpureus* from which it differs in the characters already discussed under the latter. The yellow eye is a good field character to distinguish *vivanus* from *campechanus* and *purpureus*.

This species is known to occur along the edge of the shelves bordering the southern Gulf of Mexico, the Straits of Florida, and the Caribbean Sea. North of the Yucatan Channel *vivanus* occurs sympatrically with *campechanus*. In the Caribbean Sea it occurs sympatrically with *purpureus*.

As already discussed under *campechanus* and *purpureus* absence of a shelf on both sides of the Yucatan Channel and of the Windward Passage could be interpreted as a barrier to the southward dispersal of *campechanus* and to the northward dispersal of *purpureus*. This need not be so in the case of *vivanus* since available collecting data and records from the literature (Camber, 1955: 23) indicate that this species usually occurs at depths of 80 to 100 fathoms or more.

Material examined. 18 specimens from the following 12 localities. *West Indies:* no specific locality, USNM 33264 (1). *Off Jamaica:* no specific locality, USNM 37730 (1). *Off Puerto Rico:*

Mayaguez, USNM 164632 (1). *Off Lesser Antilles:* St. Kitts, ANSP 13225 (1). *Off Panama:* 18 n. mi. ENE of Punta Manzanillo, UMIM 6100 (1); 4 n. mi. N of Cabo Tiburon, UMIM 6097 (1). *Off Cuba:* no specific locality, USNM 12557 (2); Bahia Honda, USNM 82436 (1); Havana, USNM 24782 (1), USNM 24796 (1), USNM 25010 (1). *Off Florida:* Marathon, UMIM 6010 (1); Miami UMIM 6011 (1); Port Everglades, UMIM 2626 (3), UMIM 2712 (1).

TABLE 1

Comparison of similar length specimens of *Lutjanus campechanus* complex

	L. campechanus (No. = 21)		*L. purpureus* (No. = 10)		*L. vivanus* (No. = 9)	
Character[1]	Range	Mean	Range	Mean	Range	Mean
Standard length	190-418	296	160-435	315	198-420	266
Head length	376-411	392	338-397	361	356-377	369
Snout length	146-161	151	121-147	131	127-140	135
Suborbital width	80-89	85	65-70	68	64-73	67
Maxillary length	145-158	152	129-150	138	123-146	138
Mandible length	180-195	187	160-186	172	170-177	174
Body depth	350-405	376	312-381	354	320-354	337
Pectoral fin length	316-343	329	287-313	301	310-339	321
Pelvic fin length	215-250	233	189-224	205	222-246	233
Anal fin length	268-319	288	241-288	262	243-284	256

[1] Standard length in millimeters; other characters expressed in thousandths of the standard length.

TABLE 2

Frequency distribution of lateral scales in the *Lutjanus campechanus* complex

		Lateral scales								
Species	No.	46	47	48	49	50	51	52	53	Mean
L. campechanus	76	6	14	26	22	8				48.2
L. purpureus	38				6	13	16	3		50.4
L. vivanus	18					3	11	2	2	51.2

TABLE 3

Frequency distribution of scales above lateral line and cheek scale rows in *Lutjanus campechanus* complex

	Scales above lateral line								Cheek scale rows					
Species	No.	7	8	9	10	11	12	Mean	No.	5	6	7	8	Mean
L. campechanus	76	4	42	25	5			8.4	92	9	82	1		5.9
L. purpureus	38			6	21	11		10.1	37	2	31	4		6.1
L. vivanus	18				2	9	7	11.3	18			17	1	7.1

TABLE 4

Frequency distribution of scales below lateral line in *Lutjanus campechanus* complex

	Scales below lateral line											
Species	No.	15	16	17	18	19	20	21	22	23	24	Mean
L. campechanus	79	3	20	44	10	2						16.7
L. purpureus	37		3	7	19	8						17.9
L. vivanus	17						2	3	6	4	2	22.1

TABLE 5

Frequency distribution of anal rays and of gill rakers on lower limb of first arch in *Lutjanus campechanus* complex

	Anal rays				Gillrakers						
Species	No.	8	9	Mean	No.	8	9	10	11	12	Mean
L. campechanus	126	14	112	8.9	80	2	28	48	2	12	9.6
L. purpureus	41	32	9	8.2	35		1	14	19	1	10.6
L. vivanus	18	18		8.0	18		1	4	12	1	10.7

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